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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

ED 060125

FINAL REPORT

# TECHNICAL REPORT

# ON

# STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

# FOR

# MULTIPLE-PHOTOGRAPHIC-PRINTER OPERATOR .976.782

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U. S. Employment Service in
Cooperation with
Pennsylvania State Employment Service

U. S. DEPARTMENT OF LABOR

Washington , D. C.
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# STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR MULTIPLE-PHOTOGRAPHIC-PRINTER OPERATOR 976.782

S-86

## Summary

The General Aptitude Test Battery, B-1002A was administered in March, April, July, and September 1955 to 50 workers (11 men and 39 women) employed as Multiple-Photographic-Printer Operators 976.782 by six companies in Philadelphia and Pittsburgh, Pennsylvania. The criterion consisted of broad category ratings provided by supervisors in the various plants. On the basis of mean scores, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes P-Form Perception, K-Motor Coordination and M-Manual Dexterity were selected for inclusion in the test norms.

## GATB Norms for Multiple-Photographic-Printer Operator 976.782

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Multiple-Photographic-Printer Operator

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for S-86

| B-1001 | | | B-1002 | | |
|---|---|---|---|---|---|
| Aptitude | Tests | Minimum Acceptable Aptitude Score | Aptitude | Tests | Minimum Acceptable Aptitude Score |
| P | CB-1-A<br>CB-1-L | 85 | P | Part 5<br>Part 7 | 85 |
| T | CB-1-K | 85 | K | Part 8 | 90 |
| M | CB-1-M<br>CB-1-N | 105 | M | Part 9<br>Part 10 | 100 |

## Effectiveness of Norms

The data in Table IV indicate that 12 of the 20 poor workers, or 60 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 60 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 22 of the 30 workers who made qualifying test scores, or 73 percent, were good workers.

TECHNICAL REPORT

## I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Multiple-Photographic-Printer Operator 976.782 .

## II. Sample

Fifty men and women employed as Multiple-Photographic-Printer Operators 976.782 by six firms in Pennsylvania were tested with the GATB, B-1002A in March, April, July, and September 1955. The distribution of workers by company and sex is as follows:

| Company | Men | Women | Total |
|---|---|---|---|
| Perfect Photo Co., Philadelphia | 8 | 13 | 21 |
| Albern Photo Service, Philadelphia | 1 | 5 | 6 |
| Alsey Photo Lab, Philadelphia | 1 | 1 | 2 |
| Sunray Drug Co., Philadelphia | 0 | 6 | 6 |
| Wonday Photo Service, Pittsburgh | 0 | 10 | 10 |
| Premier Photo Co., Pittsburgh | 1 | 4 | 5 |
| Total | 11 | 39 | 50 |

The sample includes all persons employed on this job by the various companies. None of the persons tested was eliminated from the final sample. Three of the workers are over 45 years old. They were not eliminated because of the difficulty in obtaining a sample of sufficient size.

There are no age, education or experience requirements for the job. The only physical requirement is good eyesight. The training period is considered to be one month. Training is conducted by the supervisor.

Table II shows the means, standard deviations, ranges, and Pearson product-moment correlations (corrected for broad categories) with the criterion for age, education and experience.

TABLE II

Means (M), Standard Deviations ($\sigma$), Ranges, and Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{c}r$) for Age, Education, and Experience

Multiple-Photographic-Printer Operator 976.782

N = 50

| | M | $\sigma$ | Range | $_{c}r$ |
|---|---|---|---|---|
| Age (years) | 31.8 | 9.1 | 18-55 | -.184 |
| Education (years) | 10.8 | 2.1 | 5-17 | .284* |
| Experience (months) | 83.2 | 62.6 | 1-300 | .245 |

*Significant at the .05 level

The correlations between age and the criterion and experience and the criterion are not significant. The correlation between education and the criterion is significant at the .05 level, indicating a slight tendency for workers with more education to receive higher ratings. The relationship is not high, however. The data in Table II indicate that this sample is suitable for test development purposes with respect to age, education, and experience.

## III. Job Description

Job Title: Multiple-Photographic-Printer Operator 976.782

Job Summary: Operates a printing machine to produce photographic prints in large quantities. Places roll of photographic paper on spindle of machine and threads paper through and over rolls and spindles to position it in machine. Positions strip of negatives in machine and observes first negative to determine required exposure. Presses selected button to expose negative to amount of light required for proper printing and depresses pedal to actuate machine. Advances strip of negatives after exposure and repeats operation for each successive negative. Removes strip of negatives and roll of exposed paper from machine after all exposures have been completed.

Work Performed: Loads Machine. Receives roll of proper kind of photographic paper from supervisor, places roll on spindle and threads end of paper through and over designated rolls and spindles to position paper in machine.

Places negatives in position. Receives batch of negatives to be printed, clipped to accompanying envelopes. Hangs envelope with negatives on hook set at left of machine at eye level while in sitting position. Sits at work table, removes one envelope and accompanying strip of negatives; places envelope on top of machine under numbering machine; strikes machine twice, placing identical numbers on envelope and on roll of photographic paper, to identify prints after developing; removes strip of negatives from clip holding them to envelope; places envelope to right on work table and centers first negative under mask of machine on work table.

Analyzes negative and decides on amount of light required to print negative properly. Quickly observes negative, noting relationship, size and density of main subject to background, including cloud effects; instantly determines amount of light required to print photo properly for best quality of picture.

Presses proper button and depresses pedal to print photo. Presses selected button to give proper amount of exposure to print picture and depresses pedal to actuate machine. (There are five buttons on machine, the center button is for normal or average negatives, the buttons on each side are normal plus, normal minus, minus and plus. Each button automatically selects a different exposure timing. As pedal is actuated the light in the machine goes on for the time of the cycle set by the selected button.)

Advances strip of negatives after exposure and centers next negative under mask. Repeats operation for each successive negative in strip.

Removes negatives. Removes strip of negatives from machine after all negatives are printed. Clips film to proper envelope and hangs both on hook at right of work table.

Removes roll of exposed paper. Removes roll of photographic paper from machine after it is completely exposed and places it in bin beside print developer. Covers roll with a damp cloth to prevent injury to prints.

IV. Experimental Battery

All of the parts of the GATB, B-1002A were administered to the sample group.

V. Criterion

The criterion consists of ratings provided by supervisors in the various plants. Each supervisor was asked to classify each of his workers into one of three broad categories (superior, average or poor) based on the worker's production of photographic prints. In arriving at a classification for a worker, the supervisor was instructed to judge the worker's production against the industry average of 5000 to 5500 prints per eight-hour day as determined by studies conducted by the Master Photo Finishers' and Dealers' Association. The number of workers classified into each category and the quantitative scores corresponding to each category, computed for purposes of the statistical analysis, are shown below.

| Category | N | Quantitative Score |
|---|---|---|
| Superior | 13 | 62 |
| Average | 17 | 52 |
| Poor | 20 | 40 |

VI. Statistical and Qualitative Analysis

Table III shows the means, standard deviations and Pearson product-moment correlations (corrected for broad categories) with the criterion for the aptitudes of the GATB.

The means and standard deviations of the aptitudes are comparable to general working population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations ($\sigma$), and Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($\sigma r$) for the Aptitudes of the GATB

Multiple-Photographic-Printer Operator 976.782

N = 50

| Aptitudes | M | $\sigma$ | $\sigma r$ |
|---|---|---|---|
| G-Intelligence | 98.4 | 16.2 | .259 |
| V-Verbal Aptitude | 98.7 | 17.1 | .314* |
| N-Numerical Aptitude | 95.7 | 19.0 | .437** |
| S-Spatial Aptitude | 100.5 | 18.2 | .006 |
| P-Form Perception | 104.9 | 20.5 | .230 |
| Q-Clerical Perception | 104.7 | 15.6 | .423** |
| K-Motor Coordination | 106.8 | 17.3 | .336* |
| F-Finger Dexterity | 109.3 | 20.1 | .154 |
| M-Manual Dexterity | 109.6 | 18.9 | .243 |

*Significant at the .05 level
**Significant at the .01 level

The statistical results were interpreted in the light of the job analysis data. The job analysis indicates that the following aptitudes measured by the GATB appear to be important for this occupation:

Intelligence (G) - necessary to make quick and accurate judgments to determine proper amount of light for printing the various types of negatives.

Form Perception (P) - necessary to perceive size and density relationships of main subject to background in negatives; necessary to perceive slight differences in shapes and shadings in negatives.

Motor Coordination (K) - necessary to place envelopes and photographic paper under the numbering machine quickly and accurately, to strike the numbering machine when material has been centered, and to select proper exposure-time button quickly after the visual determination is made.

Manual Dexterity (M) - necessary to place negatives in position rapidly under mask of printing machine, to remove film from machine, and to clip negatives and envelopes together.

In descending order of magnitude, the aptitudes with the highest means are M, F, K, P, and Q, respectively. All of the aptitudes except P and F have standard deviations less than 20.

For a sample of 50 cases, correlations of .361 and .279 are significant at the .01 level and .05 level, respectively. The aptitudes with significant correlations with the criterion are N and Q (.01 level) and V and K (.05 level).

On the basis of the qualitative and quantitative considerations pointed out above, Aptitudes P, K, and M were considered further for inclusion in the norms. All three of these aptitudes appear important on the basis of job analysis data and all three have relatively high mean scores. In addition, Aptitude K has a significant correlation with the criterion. Tetrachoric correlations with the criterion were computed for several sets of trial norms consisting of various combinations of Aptitudes P, K, and M and appropriate cutting scores. The results obtained indicated that all three of these aptitudes should be included in the test norms.

As a first approximation, cutting scores for Aptitudes P, K, and M were each set at one standard deviation below the aptitude means and rounded to the nearest five-point score levels. The cutting score for Aptitude M was then adjusted 10 points upward to effect better selective efficiency. The final cutting scores obtained are 85, 90, and 100 for Aptitudes P, K, and M, respectively. These norms have better selective efficiency than any other set of norms tried.

Aptitude G, which appears important on the basis of the qualitative analysis, was not considered further for inclusion in the test norms because of the lack of statistical evidence for this aptitude. Although Aptitudes V and N have significant correlations with the criterion, these aptitudes were not considered further because they did not appear important from the job analysis and they did not have high mean

scores. Aptitude F, which has a high mean score, was not considered further because it did not have a significant correlation with the criterion nor did it appear important from the job analysis. Although there is good statistical evidence of significance for Aptitude Q, which has a high mean and a significant correlation with the criterion, this aptitude did not appear sufficiently important from the job analysis to warrant its further consideration for inclusion in the final norms.

## VII. Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized by placing those workers who were rated "superior" and "average" into the high criterion group and those workers who were rated "poor" into the low criterion group. So constituted, the low criterion group includes 20 of the 50 workers, or 40 percent of the sample.

Table IV shows the relationship between test norms consisting of Aptitudes P, K, and M with critical scores of 85, 90, and 100, respectively, and the dichotomized criterion. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Relationship between Test Norms Consisting of Aptitudes P, K, and M with Critical Scores of 85, 90, and 100, Respectively and the Criterion for Multiple-Photographic-Printer Operator 976.782

N = 50

| | Non-Qualifying Test Scores | Qualifying Test Scores | Total |
|---|---|---|---|
| Good Workers | 8 | 22 | 30 |
| Poor Workers | 12 | 8 | 20 |
| Total | 20 | 30 | 50 |

$r_{tet} = .51$ $\quad X^2 = 4.253$

$\sigma_{r_{tet}} = .23$ $\quad P/2 < .025$

The data in the above table indicate a significant relationship between the test norms and the criterion for this sample.

## III. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes P, K, and M with minimum scores of 85, 90, and 100, respectively are recommended as B-1002 norms for Multiple-Photographic-Printer Operator 976.782. The equivalent B-1001 norms are P-85, T-85, and M-105.

## IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include three aptitudes, only those occupational aptitude patterns which include the same three aptitudes with cutting scores that are within 10 points of the cutting scores established for the specific norms are considered for that occupation. None of the existing 22 occupational aptitude patterns meets the above criteria of similarity between OAP norms and specific norms for Multiple-Photographic-Printer Operator. However, the data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.